5E5106

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Computer Science & Engineering
5CS6.1A Advance Data Structure
Common with CS, IT

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question from each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL _____   2. NIL _____

UNIT – I

Q.1 (a) Given an element x in an n–node order-statistic tree and a natural number i, how can the ith successor of x in the linear order of the tree be determined in O(log n) time. [8]

(b) Describe an efficient algorithm that, given an interval i, returns an interval overlapping i that has the maximum low endpoint, or nil [T] if no such interval exists. [8]

OR

Q.1 (a) Does deleting a leaf node from a red-black tree then reinserting the same key always result in the original tree? Prove it does or given a counter example where it does not. [8]

(b) Write a method in C to erase a pair in the dictionary with the Key in a skip list representation. What is the complexity of this method? [8]

UNIT – II

Q.2 (a) Explain Amortized Cost of Incrementing Binary Integers and potential function of Fibonacci heap. [8]

(b) Explain the implementation of a binomial heap and its operation with suitable example. [8]

OR

Q.2 (a) Show how to maintain, for every node of a 2-3-4 tree, the height of the subtree rooted at x as a field height [x]. Make sure that your implementation does not affect the asymptotic running times of searching, insertion, and deletion. [8]

(b) Show the Fibonacci heap that result from calling FIB-HEAP-EXTRACT-MIN. the maximum degree D (n) of any node in an n-node Fibonacci heap is O(log n). [8]
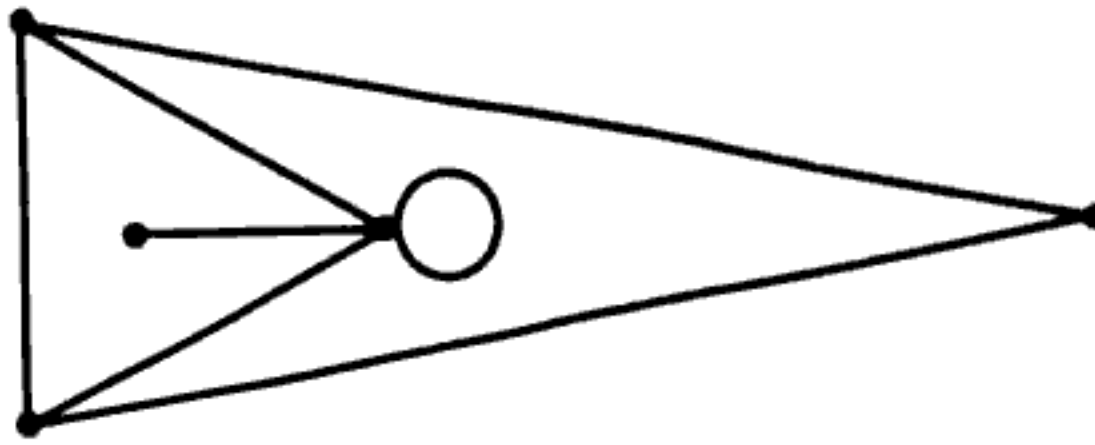
UNIT – III

Q.3 (a) Define connected components of a Graph. For the given graph give the adjacency list. [8]
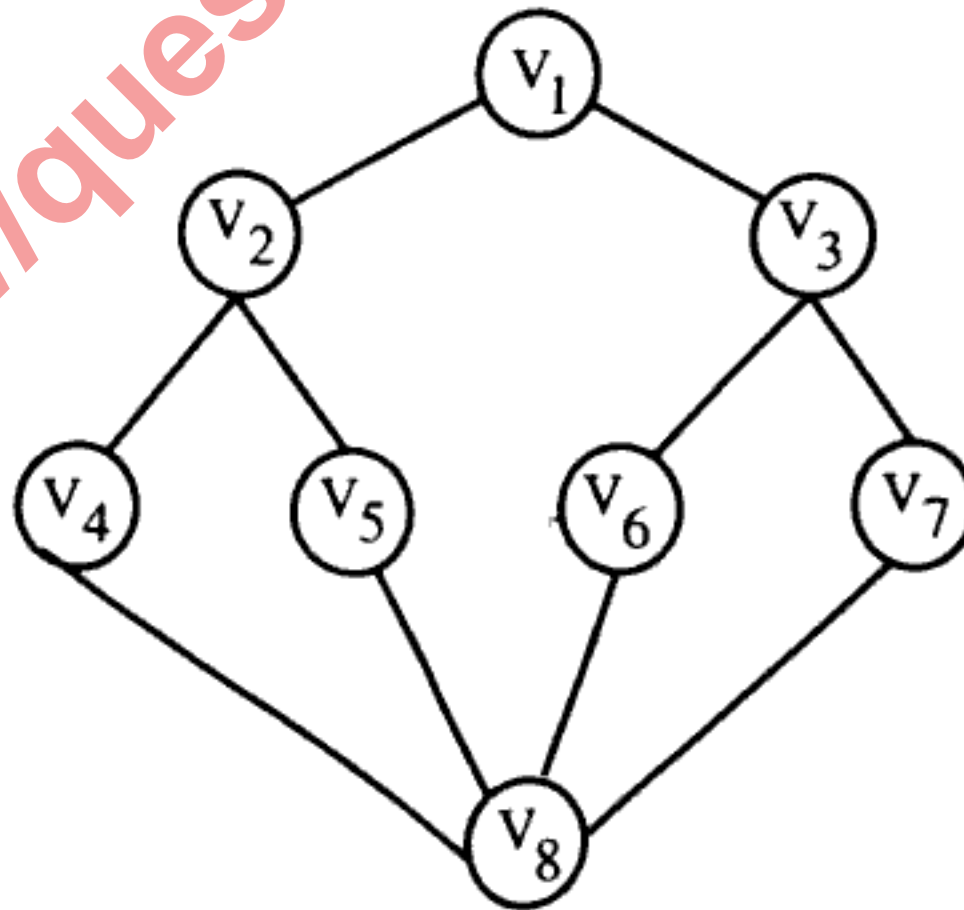

Write the BFS algorithm and traverse it starting from the vertex V_6 showing various stages. How the connected components of a graph can be determined?

(b) Define isomorphic graph. Draw three isomorphic graphs of the following. [8]

OR

Q.3 (a) Prove that for any vertex v other than the source or sink, the total positive flow entering v must equal the total positive flow leaving v. [8]

(b) Define cut-set vector and circuit vector of a graph. Find the set of all cut-set vectors and the set of all circuit vectors of the following graph: [8]
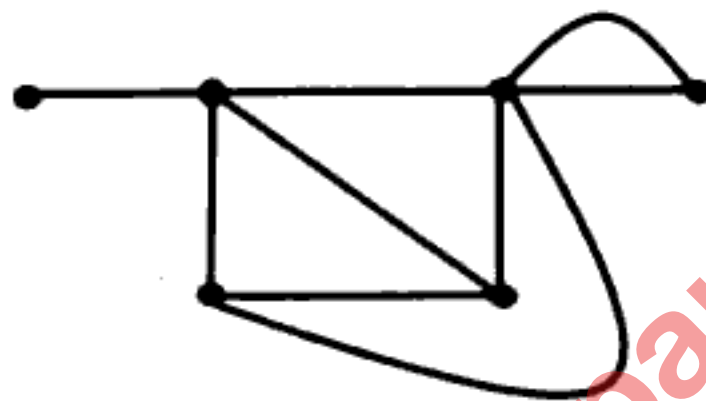
UNIT – IV

Q.4 (a) How many different zero-one input sequences must be applied to the input of a comparison network to verify that it is a merging network. [8]

(b) Consider two sequences of 0's and 1's. Prove that if every element in one sequence is at least as small as every element in the other sequence, then one of the two sequences is clean. [8]

OR

Q.4 (a) Give a sequence of m MAKE-SET, UNION, and FIND-SET operations, n of which are MAKE-SET operation, that takes Ω (mlog n) time when we use union by rank only. [8]

(b) Explain the following terms and their functioning: [4+4=8]

(i) 2-3 tree

(ii) Concatenable Queue

UNIT – V

Q.5 (a) Prove that system (Z n, +n) and (Z*n, .n) is a finite abelian group. [8]

(b) Prove that:

If n is an odd composite number, then the number of witnesses to the compositeness of n is at least (n-1)/2. [8]

OR

Q.5 (a) Discuss Miller Rabin randomized primality test? [8]

(b) Give a brief review of notation of elementary number theorem? State division theorem. [8]